Project HAB: The Effect of Harmful Algal Blooms on our Economy and Environment

By

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SHOT – COMPUTER INTRODUCTION SLIDE

Slide of a computer typing information about the project.

NARRATION (EVAN):

Good Morning Team. You have all been chosen for this highly complex mission. Our office was recently contacted by the CA Department of Public Health about a harmful algal bloom off of the Sonoma County Coast. Recent blooms of this type have had negative economic and ecological effects on the community. Your job will be to perform a geospatial analysis of this particular bloom that occurred from August to September 2011. Using NASA Earth Observing Systems and other remote sensing methods, you will provide our partner agencies with the means to understand and combat these invaders in the future.

SHOT – TITLE AND TEAM INTRODUCTIONS

SHOT – TWO PICTURES OF A RED-TIDE BLOOM

NARRATION (EVAN):

HABs, or Harmful Algal Blooms are natural phenomena consisting of the rapid growth of phytoplankton populations in coastal marine environments. These blooms can have negative environmental and public health implications. HABs kill massive amounts of abalone and other marine life along the California coast and worldwide, either through the removal of oxygen from the water column or through the release of neurotoxins, such as domoic acid, into the environment. People who consume infected marine life have also been seen to get sick, with symptoms ranging from headache and dizziness to coma and death, in severe cases. The National Oceanic and Atmospheric Administration, or NOAA estimates that HABs cause approximately eighty-two million dollars of damage annually in the United States alone, mainly from the closing of commercial fisheries and the public health costs of illnesses.

NARRATION (MIHIR):

Here at the NASA Ames Research Center, the team focusing on HABs is trying to find the key factors that affect the developments of these blooms. Our research will help our partner agencies like the California Departments of Public Health and Fish & Game by providing an enhanced understanding of the key environmental factors in HAB formation.

NARRATION (EVAN):

To begin our research, we visited the California Department of Public Health in Richmond, California. Here, we met with Dr.

Gregg Langlois who explained the extensive public health implications of HABs and also demonstrated the process by which HAB outbreaks are discovered in the lab.

This process of discovery allowed us to formulate our field work methodology. We traveled north along the California Coast to the UC Davis Bodega Marine Laboratory, where we met with science advisor Dr. John Largier.

FILMED (MAANYA):

Next, we conducted a series of field samples to gain a better understanding of HAB distribution and interaction with the marine environment. Currently these methods are not ideal for examining the full spatial and temporal extents of these blooms.

SHOT – VIDEOS & PICS OF FIELD TRIP

NARRATION (RAY):

The first step in our methodology involved downloading thirty-seven MODIS chlorophyll-alpha three day composite images from the Aqua Satellite to form the basis of our time series map, as well as to serve as the dependent variable in our predictive model. Next, variables such as sea surface height and wind information from the Jason-2 Ocean Surface Topography Mission, and sea surface temperature from NOAA's AVHRR sensor, were combined with bathymetry data to serve as the independent, predictive variables in our Generalized Additive Model.

SHOT – TIME SERIES ANIMATION

NARRATION (CAITLIN):

Our main result is a time-series map showing the progression of algal blooms along the entire California coast. It's important to point out, however, that not all of these areas you see highlighted in red are necessarily harmful algal blooms. They are simply areas with high concentrations of chlorophyll-a, which could indicate either a harmful or non-harmful bloom. Either way, the visual representation of these blooms at the small scale of the entire California coast can help scientists better understand the overall dynamics of algal blooms.

We also produced several maps illustrating global sea surface height using data from NASA's JASON-2 satellite.

SHOT – JASON-2 DATA GLOBE ANIMATION

NARRATION (CAITLIN):

This sensor collects data from individual points while orbiting from space, which is useful but requires processing in order to display data in a way that is more relevant for our project objectives. To do this, we compiled data over a span of 10 days - providing an expansive amount of points from which we could then interpolate an accurate estimation of sea surface heights across the globe.

CONCLUSION (MAANYA):

Remote sensing and GIS are valuable tools in the prediction and detection of HABs. Remote sensing has the ability to revolutionize HAB prediction and detection, which can greatly assist state agencies in preventing disease spread and protecting fisheries. With greater modeling accuracy, these tools may be used to immediately detect potential HABs and provide ample time for partner agencies to react. Such an achievement would be important to all organizations working with coastal marine life.